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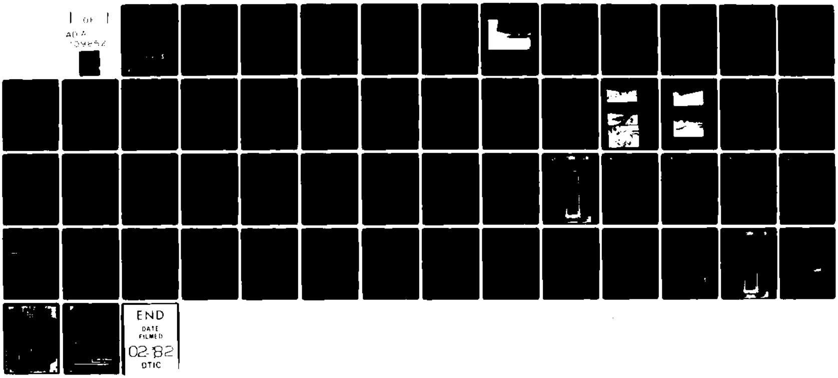

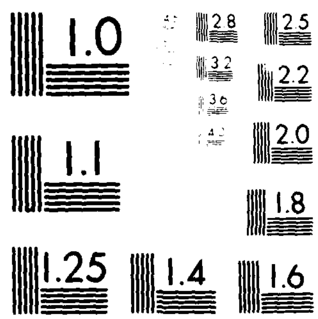

MICROCOPY RESOLUTION TEST CHART

(2)

LEVEL II

GENESEE RIVER BASIN

RUSH RESERVOIR
MONROE COUNTY
NEW YORK

INVENTORY No. NY 1341

(12) 55

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

MAY 1981

412 598

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Rush Reservoir Dam
Monroe County
Genesee River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The Phase I Inspection of the Rush Reservoir Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

The hydrologic/hydraulic analysis indicates that the impoundment will contain the runoff from the PMP without overtopping of the structure. Therefore, the spillway is assessed as adequate.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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APPENDIX

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Rush Reservoir Dam I.D. No. NY 1341
State Located:	New York
County:	Monroe
Watershed:	Genesee River Basin
Stream:	Not Applicable
Date of Inspection:	November 20, 1980

ASSESSMENT OF GENERAL CONDITIONS

The Phase I Inspection of the Rush Reservoir Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis indicates that the impoundment will contain the runoff from the PMP without overtopping of the structure. Therefore, the spillway is assessed as adequate.

The following remedial work should be undertaken during normal maintenance operations within one year:

1. Woodchuck burrows should be filled in and the rodents eliminated from the facility.

2. The area where seepage occurs should be monitored and records should be kept to detect any change in flow which might indicate worsening conditions.

3. Remove the trees from the embankment and from the area near the toe of slope.

4. A flood warning and emergency evacuation system should be implemented to alert the public in the event conditions occur which could result in failure of the dam,

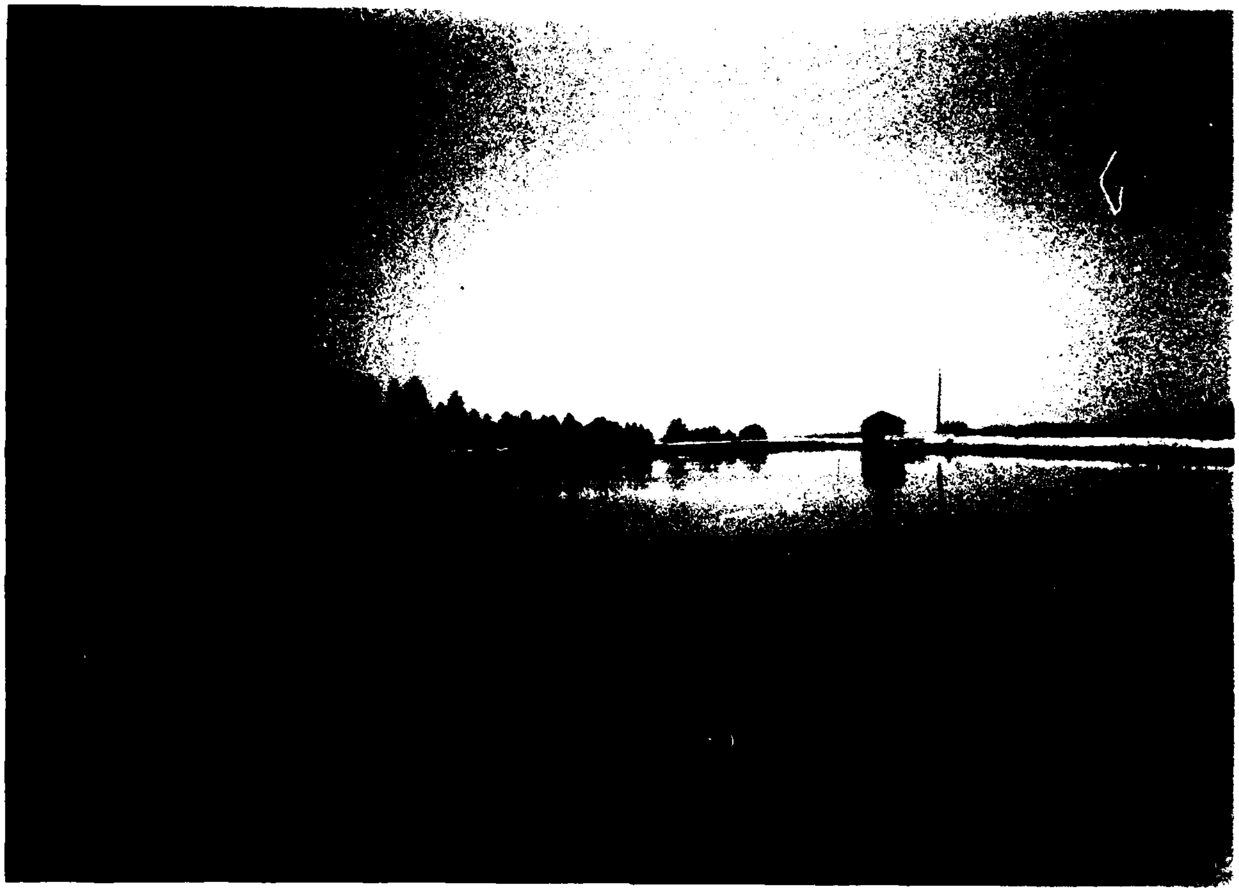
5. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility.

Dale Engineering Company

John B. Stetson, President

Approved By: Col. W. M. Smith, Jr.
New York District Engineer

Date: 30 JUN 1981



1. Overview of Rush Reservoir Dam. Screenhouse and weir chamber in background. Note mature pine tree growth at left of photo.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
RUSH RESERVOIR DAM I.D. NO. NY 1341
GENESEE RIVER BASIN
MONROE COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and the U.S. Army, Corps of Engineers.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the existing condition of the Rush Reservoir Dam and appurtenant structures, owned by the Bureau of Water, City of Rochester, New York, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the U.S. Army, Corps of Engineers.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Rush Reservoir Dam is an earthen embankment approximately 3,825 feet long constructed on a hilltop which serves as a water supply reservoir for the Bureau of Water. The 23-foot high embankment completely encircles the impoundment. The reservoir is fed through a transmission line which is connected to the Bureau of Water supply source, Hemlock Lake. The water level in the impoundment is controlled by manipulating valves in the gatehouse situated at the toe of the slope of the south easterly embankment. Flow enters the impoundment through a weir chamber and screenwell located on the southeasterly shore of the impoundment just above the gatehouse.

b. Location

The reservoir is located in the Town of Rush, Monroe County, New York, on Town Line Road between Middle Road and East Henrietta Road.

c. Size Classification

The maximum height of the dam is approximately 23.3 feet. The volume of the impoundment is approximately 193 acre feet. Therefore, the dam is in the small size classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

Numerous residential properties are located on the northwest slope of the hill upon which the reservoir is located. Therefore, the dam is in the high hazard classification as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the City of Rochester, Bureau of Water.

Contact: Roger McPherson, Director
Bureau of Water
10 Felix Street
Rochester, New York, 14608
Telephone: (716) 428-7509

f. Purpose of the Dam

The dam is used as a water supply reservoir for high service areas in the area served by the Bureau of Water.

g. Design and Construction History

Plans for the Rush Reservoir are dated as early as 1904. Other plans, dated 1904 and 1936, only indicate modifications to the piping network. There is some evidence that the Reservoir was built before 1894. These plans substantially conform to the present configuration of the facility. No information is available regarding the design or construction history of this dam.

h. Normal Operational Procedures

Water level in the reservoir is monitored electronically by the systems dispatcher who has 24-hour surveillance of the water elevations. Flow into the impoundment is controlled to maintain optimum water level consistent with the operation of the system. Further surveillance is provided through the superintendent of Upland Water Supply who dispatches personnel to personally inspect water levels at least twice a day. The superintendent of the Upland Water Supply maintains a residence at Rush Reservoir.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Rush Reservoir Dam is 16 acres.

b. Discharge at Dam Site

No discharge records are available for this site. The facility is a water supply reservoir which provides local storage for a high level area of the Bureau of Water system.

c. Elevation (Feet above MSL)

Top of Dam	758.35
Normal Pool	751.6

d. Reservoir

Length of Normal Pool	1560± ft.

e. Storage

Normal Pool	193 acre feet 63,000,000 gallons

f. Reservoir Area

Normal Pool	13.5 acres

g. Dam

Type - Earth Fill
Length - 3825 ft.
Height - 23.25 ft.
Freeboard between Normal Reservoir and Top of Dam - 6.75 ft.
Top Width - 16 ft.
Side Slopes - Exterior: 2-1/2 horizontal; 1 vertical
Interior: 2 horizontal; 1 vertical
Zoning - None
Impervious Core - Puddled clay core wall with clay reservoir lining
Grout Curtain - None

h. Overflow

Type - Broad crested weir overflow
Length - 9 ft.
Crest Elevation - 752.6
Gates - 2- 2 ft. x 4 ft. sluice gates
Discharge - 16 inch overflow outlets to open ditch remote from reservoir

i. Regulating Outlets

Water is discharged from this impoundment through the Bureau of Water water distribution system. Reservoir levels are under 24-hour surveillance by the dispatcher.

SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

Geologically, Rush Reservoir Dam is located in the Eastern Lake section of the Central Lowland Province which is part of the Interior Plains, the major physiographic division. Although the horizontally lying bedrock beneath the dam site is believed to be one of the upper units of the Salina Group of Upper Silurian age, the reservoir appears to be sited in the glacial debris of a drumlin; which formational unit of the Salina Group would be determined by the depth to bedrock beneath the reservoir, but is most likely the Camillus Shale, average thickness about 300 feet. The Camillus Shale consists mainly of soft brown to gray argillaceous shales which include layers of red shales. A number of thick layers of dolostone are present as are thin to thick layers of gypsum and anhydrite. Anhydrite layers to thicknesses of 75 feet have been reported to have been encountered in the subsurface in this region. The site is located on the Mendon-Waterloo-Auburn morainal belt. Part of this belt includes kame type deposits. Drumlins are also present. The reservoir appears to be located on a drumlin that had been modified by waves from the lake waters of the then existing glacial Lake Dana. Drumlins normally are made up of medium to coarse textured, unsorted and unstratified glacial till that has a low permeability. The soil surrounding the reservoir is the Ontario group according to the 1973 Monroe County soils report of the U.S. Department of Agriculture. The Ontario soils of this designation are very stony and located mainly on the steep slopes of drumlins. The soil is said to be slowly permeable near the surface and very slowly permeable (less than 0.2 inches per hour) below a depth of 28 inches.

b. Subsurface Investigations

No subsurface information was available concerning the foundation of the original embankment.

2.2 DESIGN RECORDS

No reports were available from the original design of the dam. The available plans are included as Figures 2 through 5.

2.3 CONSTRUCTION RECORDS

No information was available concerning the original construction.

2.4 OPERATIONAL RECORDS

There are no operation records available for this dam other than the reservoir water level readings on file with the City of Rochester, Bureau of Water.

2.5 EVALUATION OF DATA

The data presented in this report was obtained from the City of Rochester, Bureau of Water. The information available appears to be reliable and adequate for a Phase I Inspection Report.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

The Rush Reservoir Dam was inspected on November 20, 1980. The Dale Engineering Company Inspection Team was accompanied by Sanford Vreeland, Superintendent of Upland Water Supply for the Bureau of Water. During the inspection, the weather was fair with a light snow covering on the ground. Water level in the impoundment was 747.2.

b. Dam

Although the ground surface was partially obscured by a light snow cover, the conditions did not preclude an inspection of the surfaces of the embankment. The slopes of the earth fill were uniform and no evidence of displacement was detected. Numerous woodchuck burrows were detected on the outside slopes of the embankment. A number of pine trees had been well established along the western toe and on the north slope of the dam up to the crest. The crest of the dam was at a uniform level. No evidence was detected in the field to suggest subsidence of the fill material. A small area of seepage was detected at the toe of the slope on the southeast side of the embankment. The water in this area was rust color. Personnel of the Bureau of Water were aware of this situation and indicate that it has existed for some period of time. The area is inspected periodically to attempt to detect any change in quantity of flow.

c. Appurtenant Structures

Both the gatehouse and the weir chamber and screenwell were found to be in generally good condition. The concrete surfaces on the weir chamber and screen well demonstrate surface spalling and some cracking has occurred near the west corner of the screenwell. This cracking could be attributed to ice action during severe winter conditions. Pipes in the gatehouse are generally in good condition. Some minor leakage was detected at one of the pipe joints.

d. Reservoir Area

The reservoir area covers approximately 13.5 acres. The riprap slope protection on the inside slope of the reservoir is generally in good condition. No indication of displacement of material was detected.

3.2 EVALUATION

The visual inspection revealed that the embankment is generally in good condition.

The following specific items should be addressed by the Owner.

1. Woodchuck holes were detected on the downstream face of the embankment. Appropriate steps should be taken to eliminate woodchucks from the embankment.

2. Seepage was detected on the southeast embankment near the toe of the downstream slope. This area of seepage should be periodically monitored to detect increased flow which might indicate changing conditions.

3. Well established tree growth is evident along the western toe and on the north slope of the embankment. This tree growth should be removed from the embankment and from the area near the toe of the dam.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

This reservoir is used to provide local storage of potable water for use in the public water system served by the Bureau of Water. Water levels at the impoundment are constantly monitored by a system dispatcher and records are maintained of the water levels at all times. The reservoir is inspected daily by personnel from the Bureau of Water. There are no records of overflow of the system in the nearly 80 years of operation.

4.2 MAINTENANCE OF THE DAM

Maintenance and operation of the dam is controlled by the Bureau of Water. Daily visits are made to the site to check on conditions of the facilities. Water levels are held at optimum level for water supply purposes. Conditions at the site indicate that the facility is well maintained. No formalized inspection system is in effect at the facility.

4.3 MAINTENANCE OF OPERATING FACILITIES

The valves controlling flow into the impoundment are in operating condition and well maintained.

4.4 DESCRIPTION OF WARNING SYSTEM

No warning system is in effect at present.

4.5 EVALUATION

The dam and appurtenances are normally inspected by personnel from the City of Rochester, Bureau of Water, although the inspection procedure is not formalized. The facility is presently in good condition and adequately maintained. Since this dam is in the high hazard classification, a warning system should be implemented to alert the public should conditions occur which could result in failure of the dam. The inspection procedure should be formalized and records maintained so that changing conditions can be readily identified.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Rush Reservoir is located in the Town of Rush, New York. The reservoir serves as a water supply holding area and is completely encircled by the embankment which is perched above the surrounding terrain. The only contributing runoff areas consist of the reservoir and the interior embankment and a portion of the top of the berms, which constitute a relatively small area in comparison to the reservoir area.

5.2 ANALYSIS CRITERIA

The purpose of this investigation is to evaluate the reservoir system's capacity to handle runoff from precipitation events. This has been assessed through the evaluation of the effects on the reservoir from the runoff produced by the Probable Maximum Precipitation (PMP).

The reservoir's capacity to handle the runoff produced by a precipitation event is a function of the available reservoir storage, outflow over the overflow weir, the measures taken to regulate the reservoir's supply and outlet conduits, and the volume of runoff.

Water is supplied to Rush Reservoir by supply conduits from Hemlock Lake. The reservoir inflow and outflow are controlled by the valves in the gatehouse at the reservoir. The water level of the reservoir is monitored by a recording elevation gauge. This information is telemetered to the system's dispatch center which is staffed 24 hours a day. These reservoir levels are then radioed to Bureau of Water personnel.

The Probable Maximum Precipitation (PMP) is 21.6 inches according to Hydrometeorological Report (HMR #33) for a 24-hour duration storm, 200 square mile basin. Adjusting the rainfall to the lower limit of the areal adjustment graph (the drainage area is less than 10 square miles, the lower limit of the areal adjustment graph) resulted in an index PMP of 30.5 inches. A high percentage of precipitation will result in runoff as the reservoir, with a surface area of 13.5 acres, constitutes 84% of the drainage area.

5.3 SPILLWAY CAPACITY

The overflow spillway is an uncontrolled broad crested weir 9 feet long and 2 feet wide. The spillway crest is located at approximately elevation 752.6 and the top of the embankment at elevation 758.35. This results in a 5.75 feet height of flow that the spillway can accommodate before the earthen embankment is overtopped. A spillway coefficient of 3.32 was assigned for this height of flow. The discharge capacity of the spillway at the top of dam elevation is 410 cfs.

5.4 RESERVOIR CAPACITY

The reservoir storage capacity was estimated from the "Plan of the Storage Reservoir at Rush," drawing K-1 (see Figure No. 2, Appendix F). The resulting estimates of the reservoir storage capacity are shown below:

Spillway Crest	207 acre feet
Top of Embankment	288 acre feet

5.5 OVERTOPPING POTENTIAL

The surcharge storage of 81 acre feet between the spillway and the top of the embankment is equivalent to 61 inches of runoff from the drainage area. Therefore, disregarding the spillway discharge and assuming the flow through the supply and outlet conduits to be equal throughout the PMP event, the reservoir has sufficient capacity above the spillway crest to store the PMP with 2-1/2 to 3 feet of freeboard.

5.6 EVALUATION

Based on the information given by the operations staff, there will be more than sufficient operations freeboard within the reservoir to store the PMP without overtopping the embankment.

The reservoir has never been known to have been overtopped and the only way it would be overtopped would be due to an operator error on the supply end of the system. Since an operator lives on the reservoir premises, and the reservoir levels are continuously monitored by a recording gauge that telemeters these levels to the system's dispatcher center which is staffed 24 hours a day, the possibility of the reservoir being overtopped seems quite remote. Therefore, the spillway is assessed as adequate according to the Corps of Engineers' screening criteria.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Rush Reservoir is constructed of an earthen embankment that completely encompasses the reservoir and is perched above the surrounding terrain. The reservoir is basically rectangularly shaped with a trapezoidal section on the northeast end. The two longest sides of the reservoir are nearly parallel and run in a northeast-southwest direction. The crest and exterior slopes are grassed, whereas the interior slopes are lined with riprap.

The embankment generally appears to be adequately mowed and maintained. The slopes and crest were generally uniform with no evidence of structural movement or cracking. Trees were observed near the toe of the slope along the northwest embankment and on the slope to the crest on the north embankment. It appeared from the configuration of this north portion of the embankment that it might be natural ground. This observation was supported by the exterior slope lines on the "Plan of the Storage Reservoir at Rush" (see Figure No. 2, Appendix F). Numerous animal burrows (most probably woodchuck holes) were observed on the exterior slopes. A rather small area of seepage was detected on the southeast embankment near the toe of the slope. The seepage was rust colored and has been under the observation of the Bureau of Water staff. The riprap appeared to be in good condition.

b. Design and Construction Data

No information regarding the structural stability of the structure was located. Drawings included in Appendix F substantially conform to the present facility. The drawings indicate the interior slopes of the earthen embankment to be 2:1 (2 horizontal to 1 vertical) with a 5 feet wide bench at about mid-height to produce an effective slope of about 2.2:1. Riprap is shown lining the interior slopes all the way to the reservoir bottom. The exterior slopes scale to be about 2.5:1 which conforms to field observations. Bureau of Water personnel believe that there is a clay core in the embankment and a clay blanket lining the reservoir bottom. This is supported by drawing K-14 (Figure No. 3) which suggests the presence of a core and a blanket lining tying into this core.

The earliest available drawings are dated 1895. However, data contained in the published history of the Rochester Water Works indicate the reservoir was constructed sometime between 1872 and 1894.

c. Operating Records

The only operating records available are those pertaining to reservoir water levels on file with the City of Rochester, Bureau of Water.

d. Post Construction Changes

The only documented changes in the reservoir system deal with the pipe network. However, drawing K-14 (Figure No. 3) shows the "Original Front Angle" to be about 5 feet inside of the existing interior edge of the crest. This could be due to the embankment crest being raised or the addition of the interior slope bench in the design before construction commenced.

e. Seismic Stability

No known faults or lineaments suggesting faults are present in the immediate area.

The area is located within Zone 2 of the Seismic Probability Map but is only 22 miles east of an active Zone 3, which has had earthquakes with intensities as great as VIII on the Modified Mercalli Scale. As indicated below, earthquake activity in the vicinity of the reservoir has been slight.

Date	Intensity Modified Mercalli	Location Relative to Dam
1944	II	10 miles N
1977	IV	11 miles ENE

6.2 STRUCTURAL STABILITY ANALYSIS

The earthen embankment appeared to be generally uniform in section with no signs of structural instability in evidence. The wet area on the south-east embankment should be monitored as part of a formalized inspection program. The drawings show no means of collecting and controlling any leakage from the reservoir that might seep through the embankment. Even though the reservoir is intended to retain water, if the reservoir was designed under today's design standards, safeguard features would be included to prevent damaging effects from unintended reservoir leakage.

The trees should be removed from the embankment and toe area. The woodchucks should be eliminated and the holes filled with compacted backfill.

The entire embankment, as well as areas beyond the toe of the slope, should be regularly inspected as a part of a formalized inspection program to detect deficiencies. Any deficiencies and the remedial measures under-taken to correct these deficiencies should be well documented to provide historical background on which future evaluations may be based.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

The Phase I Inspection of the Rush Reservoir Dam did not indicate conditions which would constitute an immediate hazard to human life or property.

The hydrologic/hydraulic analysis indicates that the impoundment will contain the runoff from the Probable Maximum Precipitation (PMP) without overtopping the structure.

The visual inspection did not reveal condtions which would indicate evidence of structural displacement or instability.

The following specific safety assessments are based on the Phase I visual examination and analysis of hydrology and hydraulics, and structural stability:

1. Woodchuck burrows were found to exist on the exterior slopes of the embankment.

2. Minor seepage was found near the toe of the southeast slope of the embankment.

3. A mature growth of pine trees has been established along the westerly toe of the exterior slope and on the north slope of the dam up to the crest.

4. No warning system is presently in effect to alert the public should conditions occur which could result in failure of the dam.

5. No formalized inspection system is in effect at the facility.

b. Adequacy of Information

The information available is adequate for a Phase I investigation.

c. Urgency

Items 1 through 5 of the safety assessment should be addressed by the Owner and appropriate actions taken within one year of this notification.

d. Need for Additional Investigation

This Phase I Inspection has not revealed the need for additional investigations regarding this structure.

7.2 RECOMMENDED MEASURES

The following is a list of recommended measures to be undertaken to insure safety of this facility:

1. Woodchuck burrows should be filled in and the rodents eliminated from the facility.

2. The area where seepage occurs should be monitored and records should be kept to detect any change in flow which might indicate worsening conditions.

3. Remove the trees from the embankment and from the area near the toe of slope.

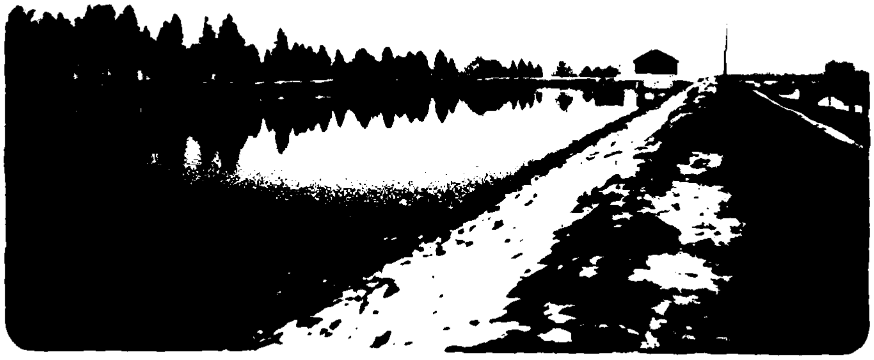
4. A flood warning and emergency evacuation system should be implemented to alert the public in the event conditions occur which could result in failure of the dam.

5. A formalized inspection system should be initiated to develop data on conditions and maintenance operations at the facility.

APPENDIX A

PHOTOGRAPHS

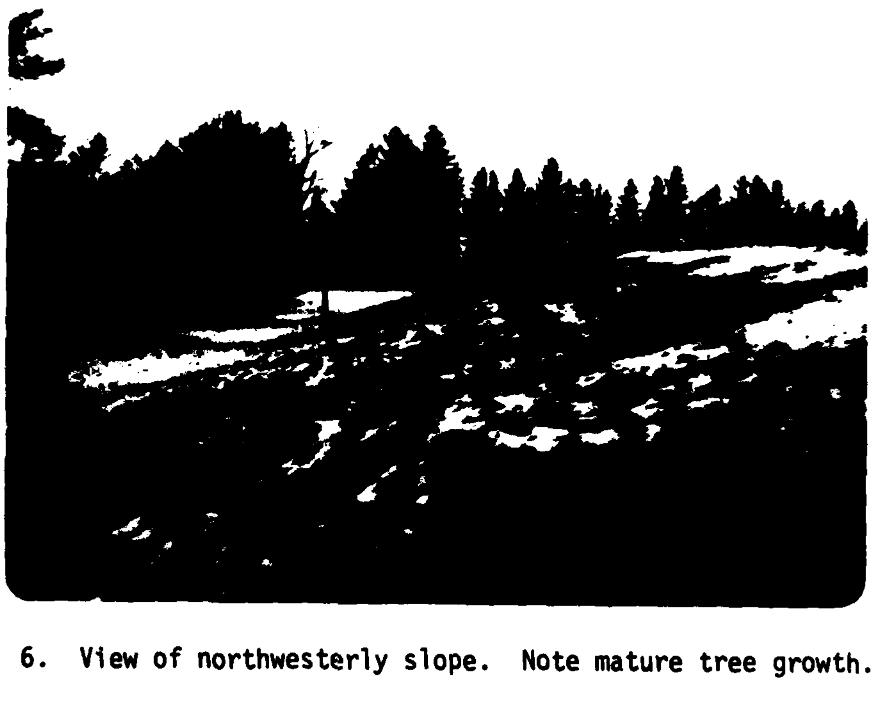
2. Southeast slope of earth embankment. Screenhouse & wier chamber at top of slope. Gatehouse at toe.



3. Top of southeast embankment.

4. Area of seepage at toe of southeasterly slope.

5. Reservoir slope. Note tree growth.



6. View of northwesterly slope. Note mature tree growth.

APPENDIX B

VISUAL INSPECTION CHECKLIST

93-15-3(9/80)

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam RUSH RESERVOIR DAM

Fed. I.D. # N.Y 1341 DEC Dam No. ______

River Basin GENESEE RIVER

Location: Town RUSH County MONROE

Stream Name N/A

Tributary of N/A

Latitude (N) 43 - 01.0 Longitude (W) 077 - 38.6

Type of Dam EARTH FILL

Hazard Category HIGH

Date(s) of Inspection NOV 20, 1980

Weather Conditions FAIR

Reservoir Level at Time of Inspection 747.2

b. Inspection Personnel F.W. BYSZEWSKI, J.A. GOMEZ, B. COLWELL, H. MUSKATT, - DALE ENG. SANFORD VREELAND - ROCHESTER BUREAU OF WATER

c. Persons Contacted (Including Address & Phone No.)

SANFORD VREELAND SUPT. UPLAND WATER SUPPLY
10 FELIX ST 716-334-4594 (RUSH RESERVOIR)
ROCHESTER N.Y 14608

d. History:

Date Constructed 1904 Date(s) Reconstructed —

Designer UNKNOWN

Constructed By UNKNOWN

Owner CITY OF ROCHESTER BUREAU OF WATER

2) Embankment

a. Characteristics

(1) Embankment Material UNKNOWN

(2) Cutoff Type NONE

(3) Impervious Core CLAY PUDDLE

(4) Internal Drainage System NONE

(5) Miscellaneous —

b. Crest

(1) Vertical Alignment NO MISALGNMENT EVIDENT

(2) Horizontal Alignment NO MISALIGNMENT EVIDENT

(3) Surface Cracks NONE NOTED (LIGHT SNOW COVER AT TIME OF INSPECTION)

(4) Miscellaneous —

c. Upstream Slope

(1) Slope (Estimate) (V:H) 1:2

(2) Undesirable Growth or Debris, Animal Burrows NONE OBSERVED

(3) Sloughing, Subsidence or Depressions NONE OBSERVED

(4) Slope Protection RIP RAP – GOOD CONDITION

(5) Surface Cracks or Movement at Toe TOE UPSTREAM OBSCURED BY IMPOUNDED WATER

d. Downstream Slope

(1) Slope (Estimate - V:H) 1 : 2½

(2) Undesirable Growth or Debris, Animal Burrows NUMEROUS WOODCHUCK BURROWS. A NUMBER OF PINE TREES ALONG WESTERN TOE AND ON NORTH SLOPE TO THE CREST.

(3) Sloughing, Subsidence or Depressions NONE OBSERVED

(4) Surface Cracks or Movement at Toe NONE OBSERVED (LIGHT SNOW COVER AT TIME OF INSPECTION)

(5) Seepage SMALL AREA AT TOE OF SLOPE ON SOUTH EAST SIDE, RUST COLORED

(6) External Drainage System (Ditches, Trenches; Blanket) NONE

(7) Condition Around Outlet Structure N/A

(8) Seepage Beyond Toe NONE OBSERVED

e. Abutments - Embankment Contact

N/A

(1) Erosion at Contact N/A

(2) Seepage Along Contact N/A

3) Drainage System

a. Description of System NONE

b. Condition of System —

c. Discharge from Drainage System —

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) NONE

5) Reservoir

a. Slopes N/A [DESCRIBED IN 2)]

b. Sedimentation INSIGNIFICANT — POTABLE WATER

c. Unusual Conditions Which Affect Dam NONE NOTED

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) NUMEROUS HOMES JUST BELOW NORTHWEST EMBANKMENT

b. Seepage, Unusual Growth N/A. (SEE 2.) d. 5.)

c. Evidence of Movement Beyond Toe of Dam NONE OBSERVED

d. Condition of Downstream Channel N/A.

7) Spillway(s) (Including Discharge Conveyance Channel)

NONE

a. General —

b. Condition of Service Spillway —

c. Condition of Auxiliary Spillway —

d. Condition of Discharge Conveyance Channel —

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit ______ Other ______

Material: Concrete ______ Metal CAST IRON Other ______

Size: 36" Length N/A CONNECTS TO SYSTEM

Invert Elevations: Entrance 725.1 Exit N/A

Physical Condition (Describe): Unobservable ______

Material: CAST IRON - GOOD (OBSERVED IN GATE HOUSE)

Joints: GOOD Alignment GOOD

Structural Integrity: NO APPARENT STRUCTURAL PROBLEMS OBSERVED.

Hydraulic Capability: VARIABLE THROUGH DISCHARGE INTO THE SYSTEM.

Means of Control: Gate ✓ Valve ✓ Uncontrolled ______

Operation: Operable ✓ Inoperable ______ Other ______

Present Condition (Describe): ENTIRE FACILITY IS IN GOOD CONDITION AND WELL MAINTAINED.

9) Structural

a. Concrete Surfaces N/A

b. Structural Cracking N/A

c. Movement - Horizontal & Vertical Alignment (Settlement)
NONE OBSERVED

d. Junctions with Abutments or Embankments N/A

e. Drains - Foundation, Joint, Face NONE

f. Water Passages, Conduits, Sluices ALL WERE IN GOOD CONDITION, OPERABLE, WELL MAINTAINED

g. Seepage or Leakage NONE OBSERVED

93-15-3(9/80)

h. Joints - Construction, etc. N/A

i. Foundation N/A

j. Abutments N/A

k. Control Gates : VALVES IN GOOD CONDITION

l. Approach & Outlet Channels N/A

m. Energy Dissipators (Plunge Pool, etc.) N/A

n. Intake Structures SOME CRACKING AND MINOR SEEPAGE IN FOUNDATION WALL

o. Stability EARTH DAM SHOWS NO EVIDENCE OF INSTABILITY

p. Miscellaneous N/A

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition

GATE HOUSE - WELL MAINTAINED - GOOD CONDITION

WEIR CHAMBER & SCREEN WELL - WELL MAINTAINED

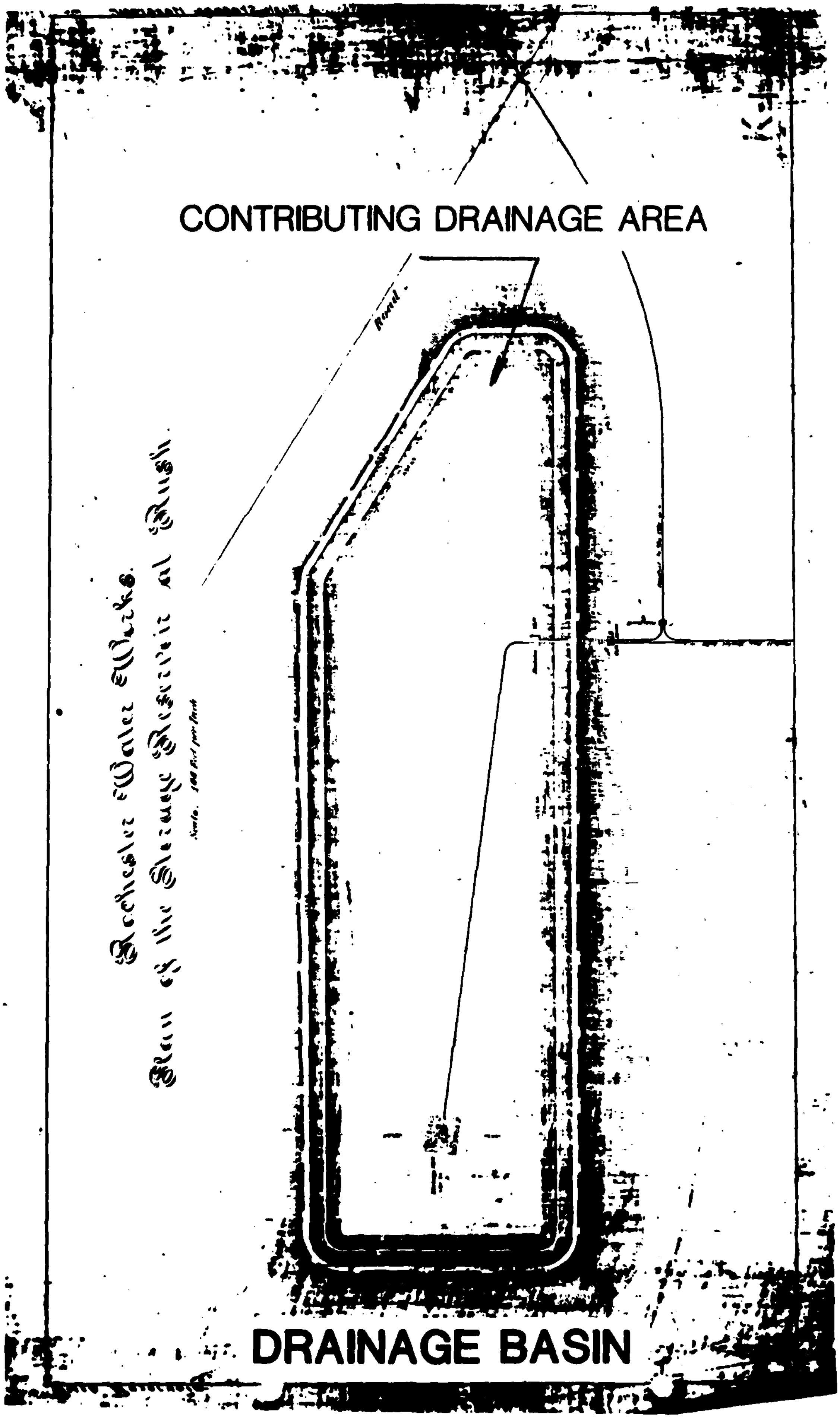
GOOD CONDITION

11) Operation Procedures (Lake Level Regulation):

WATER IS FED TO THE RESERVOIR FROM THE SOURCE AT HEMLOCK LAKE. WATER LEVELS ARE MONITORED ON A 24 HR BASIS BY THE SYSTEM DISPATCHER THROUGH TELEMETERED LEVEL INDICATORS AND RECORDERS. IMMEDIATE REMEDIAL ACTION IS TAKEN TO AVOID DISCHARGE FROM OVERFLOW WEIR. ON SITE INSPECTION OF WATER LEVEL IS PROVIDED AT LEAST TWICE DAILY. NO EMERGENCY WARNING OR EVACUATION PLAN IS PRESENTLY IN EFFECT.

APPENDIX C

HYDROLOGIC/HYDRAULIC, ENGINEERING DATA AND COMPUTATIONS


CONTRIBUTING DRAINAGE AREA
Road
Rochester Water Works
Plan of the Storage Reservoir at Rush
DRAINAGE BASIN

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 **DESIGN BRIEF**

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 12-19-80

SUBJECT Rush Reservoir Dam, ID# 1341 PROJECT NO. 2520

Depth-Area-Duration DRAWN BY JAG

PMP from HMR #33
for Lat. ~ 43°01' Long. ~ 77°39'
Index Rainfall = 21.6" for 200 mi², 24 hr
Zone 2

Duration	% Index*	Depth
6 hrs.	117	25.3"
12 hrs.	127	27.4
24 hrs	141	30.5
48 hrs	151	32.6

* Adjusted for site area (these are adjusted for 10 mi², the lower limit of the areal adjustment graph).

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-14-81
SUBJECT Rush Reservoir PROJECT NO. 252C
Overflow Spillway Capacity DRAWN BY JAG

Spillway Length = 9'
Spillway Width = 2' Broad Crested Concrete Weir
Crest Elevation = 752.6
Top of Embankment Elev. = 758.35
Freeboard @ Spillway Pool = 5.75'

From King & Brater - "Handbook of Hydraulics"
Table 5-3
$C = 3.32$ for $H = 5.75'$

$Q = CLH^{3/2}$

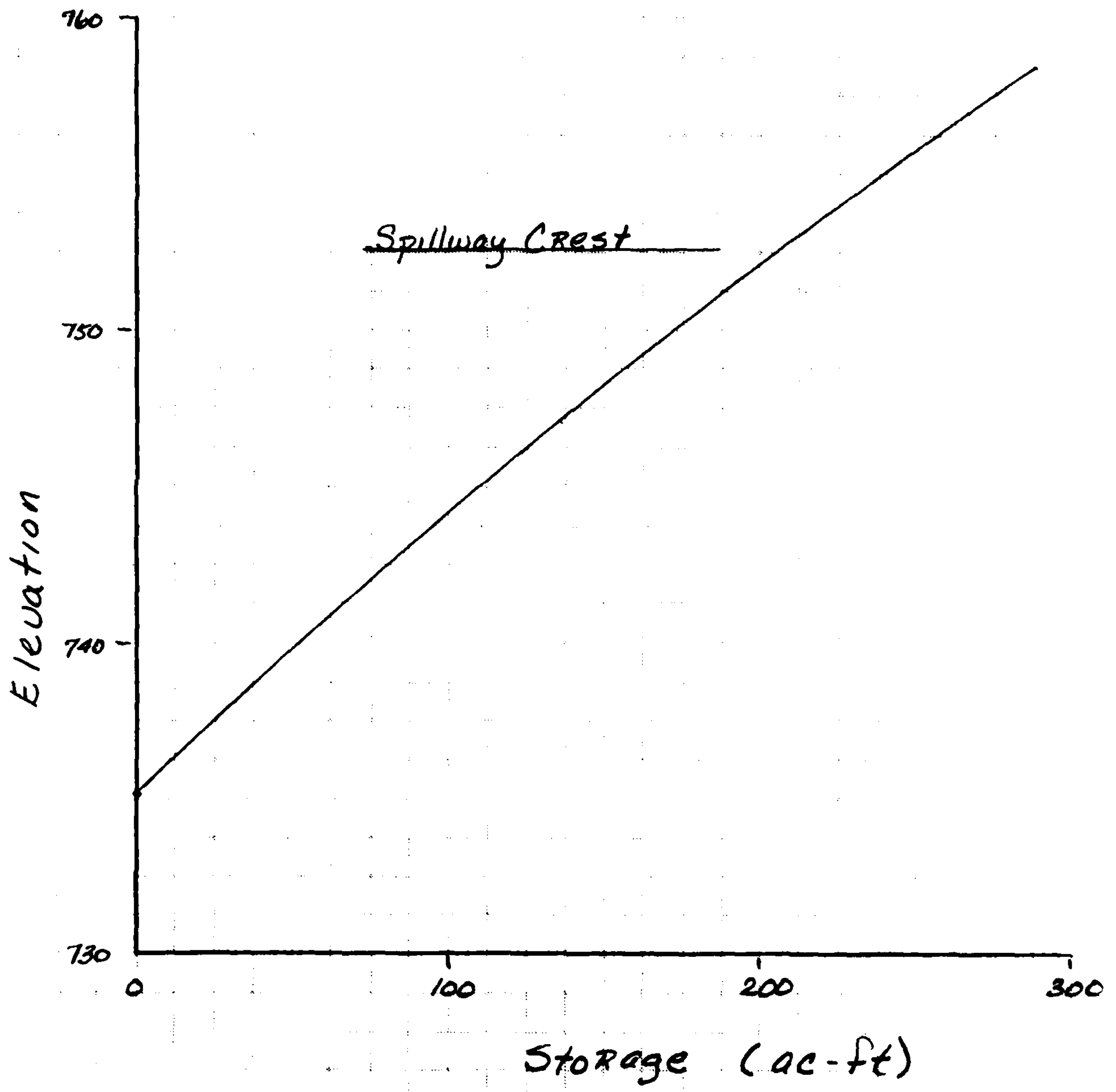
for $H = 5.75'$
$Q = 3.32(9')(5.75')^{3/2}$
$\underline{Q = 410 \text{ cfs}}$

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315•797•5800 DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-14-81

SUBJECT Rush Reservoir PROJECT NO.

Stage - Storage Curve DRAWN BY



STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501 TEL 315-797-5800 DESIGN BRIEF

PROJECT NAME N.Y.S. Dam Inspections 1981 DATE 1-14-81
UBJECT Rush Reservoir PROJECT NO. 2520
DRAWN BY

Drainage Area = 16 acres

Storage Volume @ 752.6 (Spillway Crest) = 207 ac-ft
Storage Volume @ 758.35 (Top of Embankment) = 288 ac-ft

Surcharge Storage = 81 ac-ft

Equivalent Runoff = $\frac{81 \text{ ac-ft}}{16 \text{ acres}}$ = 5.06' = 61"

Rush Reservoir
NY # 1341

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	758.4		288
2) [redacted] ([redacted]) Normal Pool	751.6	13.5	193
3) Auxiliary Spillway Crest			
4) Pool Level with Flashboards			
5) Service Spillway Crest	752.6		207

DISCHARGES

	Volume (cfs)
1) Average Daily	40 MGD
2) Spillway @ Maximum High Water	410
3) Spillway @ Design High Water	N/A
4) Spillway @ Auxiliary Spillway Crest Elevation	N/A
5) Low Level Outlet	Through water supply transmission lines
6) Total (of all facilities) @ Maximum High Water	
7) Maximum Known Flood	Unknown
8) At Time of Inspection	Unknown

CREST: ELEVATION: 758.4

Type: Earth fill

Width: 16' Length: 3825'

Spillover N/A

Location

SPILLWAY:

PRINCIPAL		EMERGENCY
N/A	Elevation	752.6
	Type	Broad crested weir
	Width	9'
	Type of Control	
	Uncontrolled	✓
	Controlled:	
	Type (Flashboards; gate)	
	Number	
	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
	Chute Length	
	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

HYDROMETEROLOGICAL GAGES:

Type : Water level gage

Location: Weir Chamber

Records:

Date -

Max. Reading - Unknown - Never known to top reservoir embankment

FLOOD WATER CONTROL SYSTEM:

Warning System: water level readings are taken on a 24 hr. basis and monitored by the system dispatcher through telemetered level indicators and recorders

Method of Controlled Releases (mechanisms):

Through the water supply system.

DRAINAGE AREA: 16 acres

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Interior Slopes of Reservoir

Terrain - Relief: 2:1 (horiz. to vert.)

Surface - Soil: Grassed surface with Rip Rap nearer water surface

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

High Runoff potential due to steep slope

Potential Sedimentation problem areas (natural or man-made; present or future)

None Known

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

N/A

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: Earthen dike surrounds reservoir (no low areas)

Elevation: 758.4

Reservoir:

Length @ Maximum Pool 0.3 ± (Miles)

Length of Shoreline (@ Spillway Crest) 0.7 ± (Miles)

APPENDIX D

REFERENCES

APPENDIX

REFERENCES

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12. T.C. Hopkins, 1914, The Geology of the Syracuse Quadrangle, New York State Museum Bulletin 171

13. Soil Survey of Monroe County, New York, 1977, United States Department of Agriculture, Soil Conservation Service.

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APPENDIX E

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

THE HISTORY OF THE ROCHESTER WATER WORKS

Prior to its incorporation in 1834 as a City, and for 40 years thereafter, Rochester, New York obtained its water supply from private wells and cisterns. A number of attempts were made during that time to organize and construct a unified public supply. The first water company was incorporated in 1835, only one year after the City had been created. This company expired a year later without having accomplished any construction. A second water company was incorporated in 1852. This company created considerable controversy by a proposal for the City to be a stockholder. After a number of attempts, the City finally withdrew.

The company struggled for twenty years. During this time, the City Council appointed a committee to study the various possible sources of water for a public supply. Eleven sources were evaluated. It is interesting to note that in comparison with Upland sources such as Hemlock Lake, Lake Ontario was not chosen, not so much because of the quality of the water, but because of the cost of pumping from Lake Ontario elevation to the City which was some 200 feet higher in elevation and the fact that the technology of the day for intake construction required a tunnel, which in turn required a rock formation under the lake which was not available very close to Rochester. Apparently, technology for laying a pipe intake on the lake bottom was not sufficiently developed at that time. After a number of delays, this company did commence construction on July 2, 1867. Prior to going bankrupt in 1872, this company laid approximately 8 and 1/2 miles of pipe within the City, ranging in size from 16 inch to 6 inch. It also installed 33 hydrants. These facilities were acquired by the City and incorporated into the City's water system in 1882; therefore, part of the existing system may be well over 100 years old. This company had planned on using Hemlock Lake as a source of supply. It did construct a reservoir which can still be seen on the West side of Route 15A, just south of the New York thruway. It also constructed the wood stave pipe from this reservoir to the City line. Thru an oversight, no air release valves were installed on this wood stave pipe and when an attempt was made to fill it, the air pockets in the high points made the line inoperable. The leakage was so great from this wood stave pipe that it was not deemed worthwhile to install the air release valves. The failure of this transmission line probably became a large factor in the company's ultimate bankruptcy. A third water company was planned in 1872, but failed in organization.

The State Legislature finally resolved the problem of a water supply, by an act which required the Mayor to appoint a water commission, which in turn was required to provide a plan and estimate to the Mayor. When approved by the Mayor, the commissioners were then directed to proceed with their plans and were impowered to borrow the necessary money for the work. City Council was ignored, except that it was ordered to pay all expenses incurred by the commissioners. This disregard for the City Council obviously led to considerable dispute and hostility toward water works commissioners. In spite of the debates and opposition, the commission did persist and succeeded in creating the original Rochester Water Works System. They proceeded to employ J. Nelson Tubbs as Chief Engineer. Tubbs was described in the following manner, "While thoroughly versed in the science of his profession, he never hesitated to set formulas, and formulated methods at defiance when his own genious has dictated a better way or a larger result." He was described in 1876 by the commissioners as genial in intercourse, patient under trials and disappointments, cool and undaunted in the presence of difficulties, clear in judgment, accurate in detail, rarely mistaken in his estimate of resu[illegible], of strict integrity, firm in purpose, and of remarkable executive ability. A few years later, in 1890, Mr. Tubbs was requested to resign because the conduit from Hemlock Lake was not delivering as muchwateras someone thought it should. Mr. Tubbs employed Emil Kuichli

as an assistant engineer. Mr. Kuichling was a graduate of the University of Rochester with degrees in arts and engineering. He later graduated from the Polytechnic School at Carlsruhe, Germany with a degree in Civil Engineering. His attitude was considered to be less in defiance of set formulas and formulated methods. On July 15, 1872, the Mayor approved plans submitted by Tubbs and Kuichling. These called for two water systems instead of one. A fire-fighting system with a separate distribution grid would take its supply from the Genesee River. The other system, for domestic and industrial purposes, would take its supply from Hemlock Lake. A contract for pumping equipment for the fire-fighting system included water turbines and steam engines and was awarded to the Holly Manufacturing Company of Lockport on February 27, 1873. This water system became known as the Holly System, a title which has survived to this date. Work on the Holly and domestic systems proceeded simultaneously. The Holly Pump Station was constructed rapidly and on February 18, 1874, Tubbs demonstrated the capabilities of the Holly System in a most spectacular manner which was befitting his personality. One phase of the test consisted in operating fourteen fire streams at once, while changing the pumps from water power to steam without noticeable affect. The heights of these streams varied from 131 to 152 feet. Another phase demonstrated the simultaneous discharge of 30 fire streams. The pump pressure was 135 psi and the total discharge rate was 8,220 gallons per minute. Another phase demonstrated a four inch vertical stream to a height of almost 295 feet. This discharged 4,938 gallons per minute at a pump pressure of 175 psi. Another phase demonstrated a five inch vertical stream to an elevation of 257 feet, at a discharge rate of 6,463 gallons per minute, with a pump pressure of 140 psi. This demonstration delighted the spectators, and any doubt as to the wisdom of a public water supply was instantly dispelled. The original domestic system consisted of an intake facility at Hemlock Lake and a conduit from the lake to the City. This conduit consisted in part of 36 inch riveted wrought iron and, closer to the City, of 24 inch cast iron pipe. This was a considerable project. It required a ditch about 5 feet wide and 6 to 15 feet deep and 26 miles long. This had to be constructed without power equipment. It is said that the work force consisted of 700 to 900 men quartered in field camps and laboring for two years. An equalizing reservoir was constructed at Rush, New York with a capacity of 63 million gallons. A distribution reservoir was also constructed in Highland Park, then known as Mt. Hope, with a capacity of 26 million gallons. Hemlock Lake's elevation was 905, Rush 751, and Highland 638 feet U.S.G.S. This provided adequate head for gravity flows. The capacity of the original system completed in 1874 was soon inadequate, due to increased consumption within the City and some deterioration of the flow capacity of the conduit system. Therefore, a new conduit was authorized and construction began in 1894. This included a new intake and Gate House and a 6 foot brick tunnel from the Gate House to a point about 13,000 feet towards the City. The original intake in Conduit I from the lake to the northern terminus of this tunnel have since been abandoned. The Cobbs Hill Reservoir, with a capacity of 144 million gallons at the same elevation as Highland Reservoir was constructed between 1905 and 1908. These three reservoirs therefore provide a capacity of 234 million gallons of storage. This is a very generous supply, compared with our average day use of approximately 52 million gallons. In 1914, a third conduit was required. This paralleled Conduit II. Whereas Conduit II had been constructed of riveted steel and cast iron in a 38 inch diameter, Conduit III was 37 inches in diameter, partly steel and partly cast iron. Canadice Lake, at elevation 1,099 U.S.G.S., with 2 billion gallons usable capacity, was added to the system in 1919. This water is released into Hemlock Lake, as required. The conduit system that resulted was fairly complex. The three conduits were interconnected in a number of places and valves could isolate sections and direct the flow between the conduits. After the tunnel was completed to the north of Hemlock Lake and after Conduit I was abandoned in the same area, there was only one facility to supply water from Hemlock to the end of the tunnel, known as overflow number one. This was used continuously

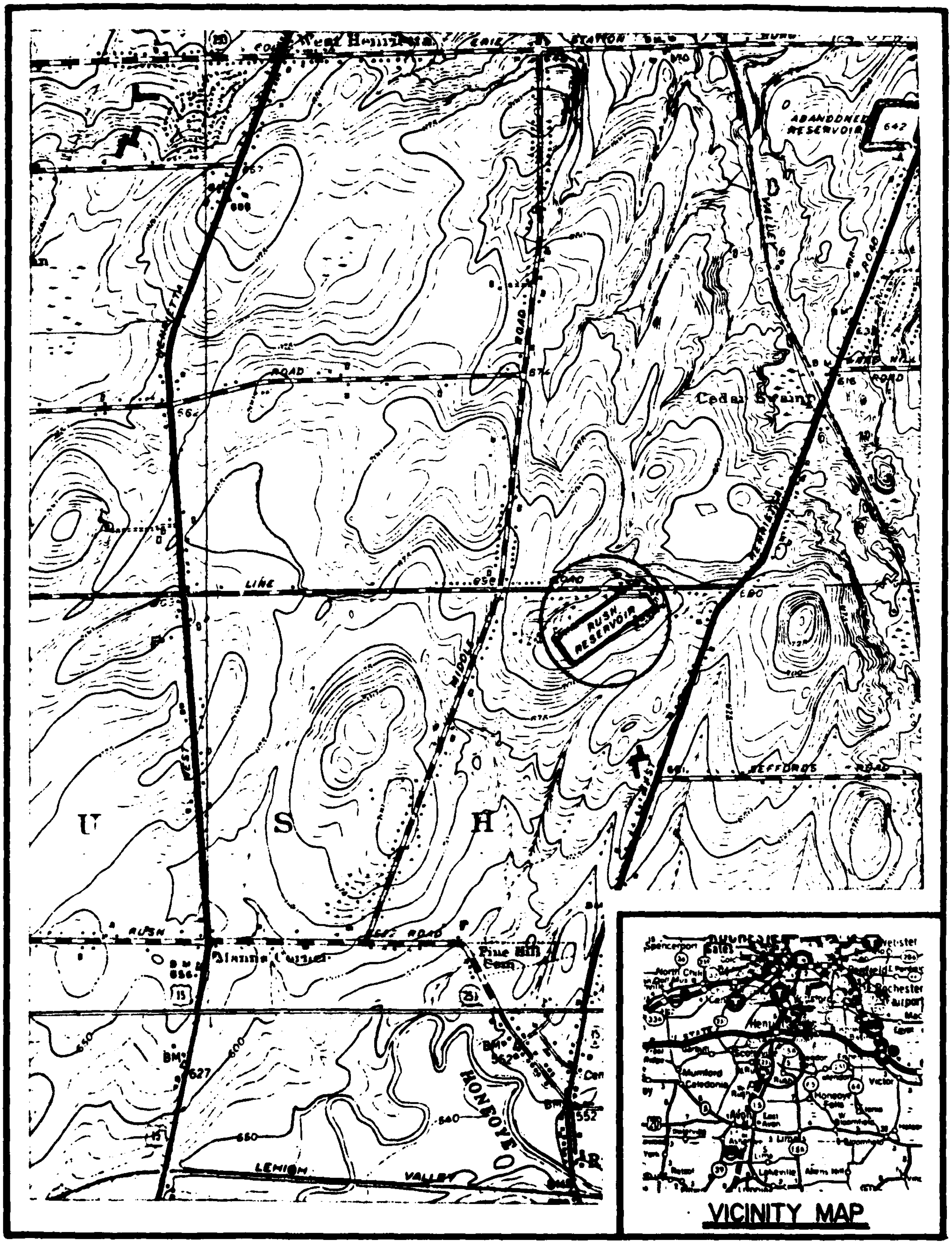
from 1894 until 1965. At this time, a pump station and 36 inch bypass line were constructed, so that the tunnel could be inspected and so that there would be an alternate supply in case of a failure of the tunnel. Upon inspection, the tunnel was found to be in excellent conditions.

As early as 1926, it became apparent that an additional supply would soon be needed. Various sources were evaluated. The urgency waxed and waned. A number of schemes were developed for increasing the supply from Upland sources. There was a very strong public resistance to using Lake Ontario. Representatives of the State Health Department finally resolved the controversies. They pointed out that their approval would be necessary before any additional construction could begin and that their evaluation would include the adequacy of supply, as well as the quality, and it was evident that difficulties would arise in providing a supply from Upland sources that would be adequate for any lengthy period of time in the future. Finally, construction began in 1952 on a treatment plant at Lake Ontario, in a booster station on Mt. Read Blvd. near Ridge Road, designed to provide an additional supply of 36 million gallons a day. Raw water was obtained from Lake Ontario thru Eastman Kodak's intake line. This system was completed in 1955. The Monroe County Water Authority constructed a new intake line in 1963. At that time, the City contracted with them for a joint ownership so that the City is entitled to 40 million gallons a day from this intake line. A low lift pump station was later constructed adjacent to the intake, and in 1965 our pumps were removed from the Kodak intake and our supply line was reconnected to our new low lift pump station and our Lake Ontario supply system was complete. The original Holly Pump Station was electrified and remodeled. However, it is now obsolete and in need of extensiv repair work. Construction of a new modern Holly Pump Station has now been authoriz and the design is under way.

The Rochester Water Works has a heritage of good design and construction. It now consists of about 690 miles of pipe, 7,000 hydrants, 25,000 valves, and 60,000 meters. Incidentally, it is interesting to note that the City was 100 percent metered by 1926. The Hemlock system provides a peak capacity of 48 million gallons a day and an average capacity of 31 million gallons a day. This combined with the Lake Ontario supply of 36 million gallons a day, provides an adequate reserve. We are justly proud of this enviable water system which will soon be 100 years old.

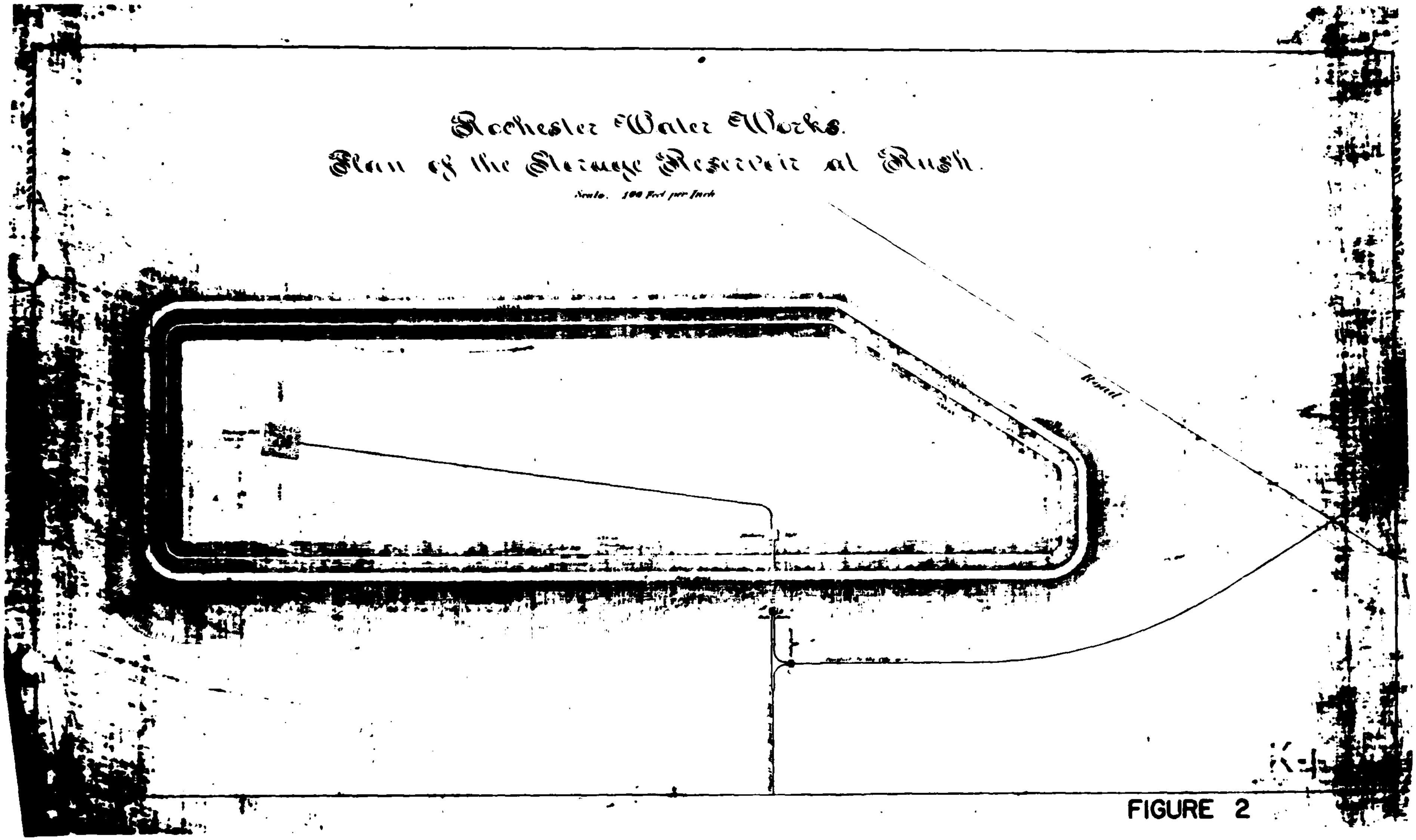
APPENDIX F

DRAWINGS



LOCATION PLAN

FIGURE 1



Rochester Water Works.
Plan of the Storage Reservoir at Rush.
Scale. 100 Feet per Inch
Road.
K-1

FIGURE 2

RUSH RESERVOIR

CROSS SECTION OF BANK

SCALE 1"=20'

NOTES:

1. TRACED FROM DRAWING K-14 WHICH WAS NOT ABLE TO BE REPRODUCED.
2. CITY OF ROCHESTER, BUREAU OF WATER PERSONEL BELIEVE CORE AND BLANKET LINING TO BE CLAY.

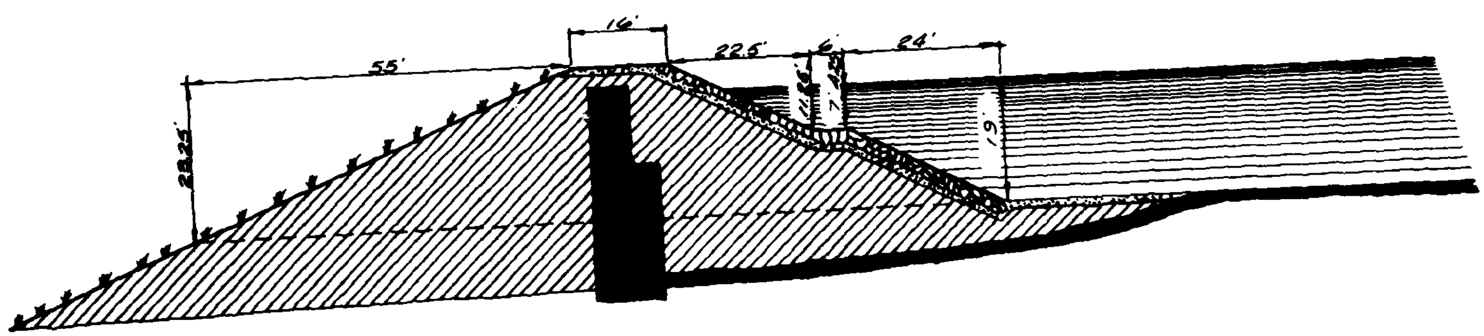


FIGURE 3

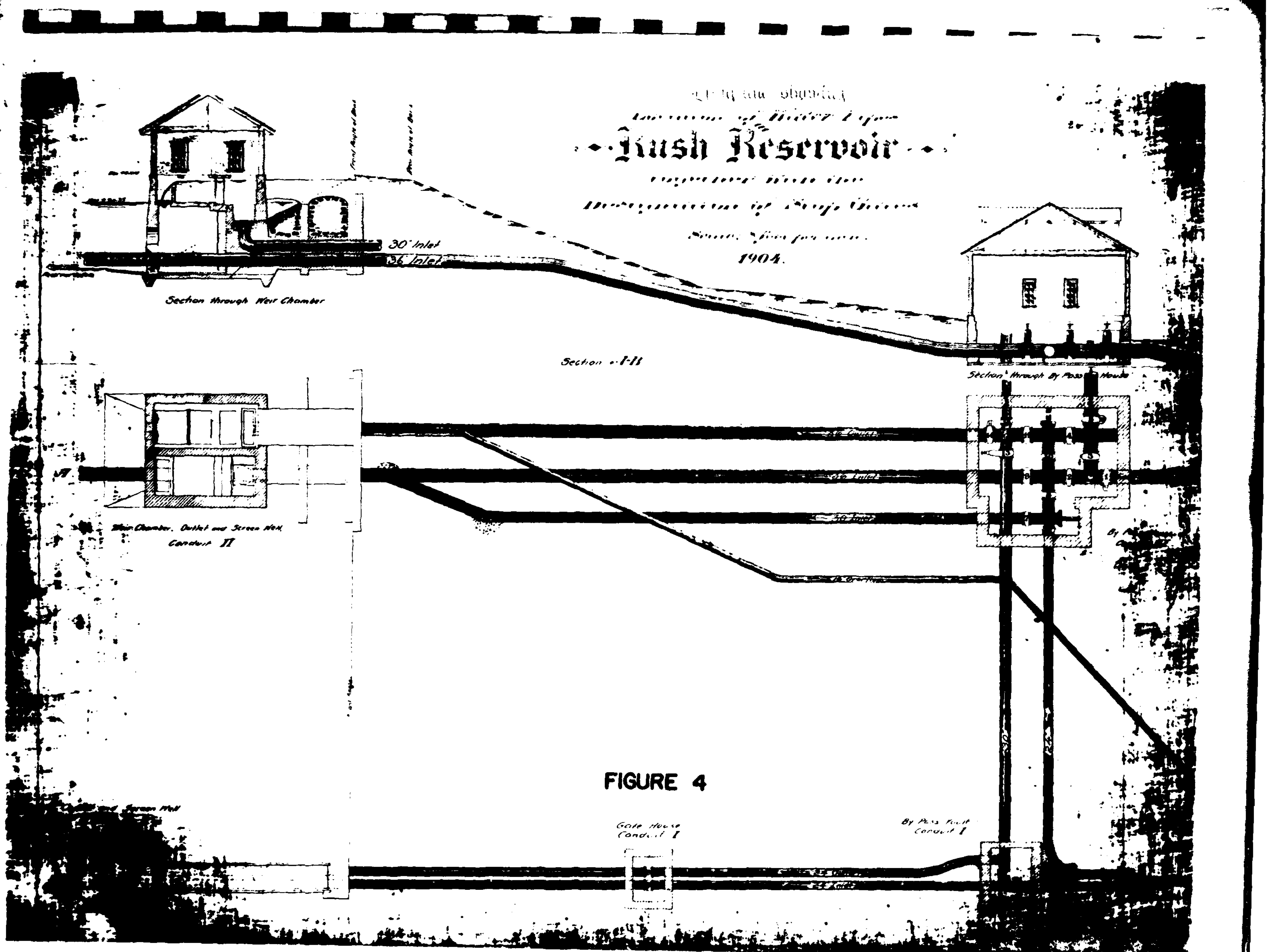

Rush Reservoir
1904.
30" Inlet
36 Inlet
Section through Weir Chamber
Section A-B
Section through By Pass House
Conduit II
Gate House
Conduit I
By Pass Vault
Conduit I

FIGURE 4

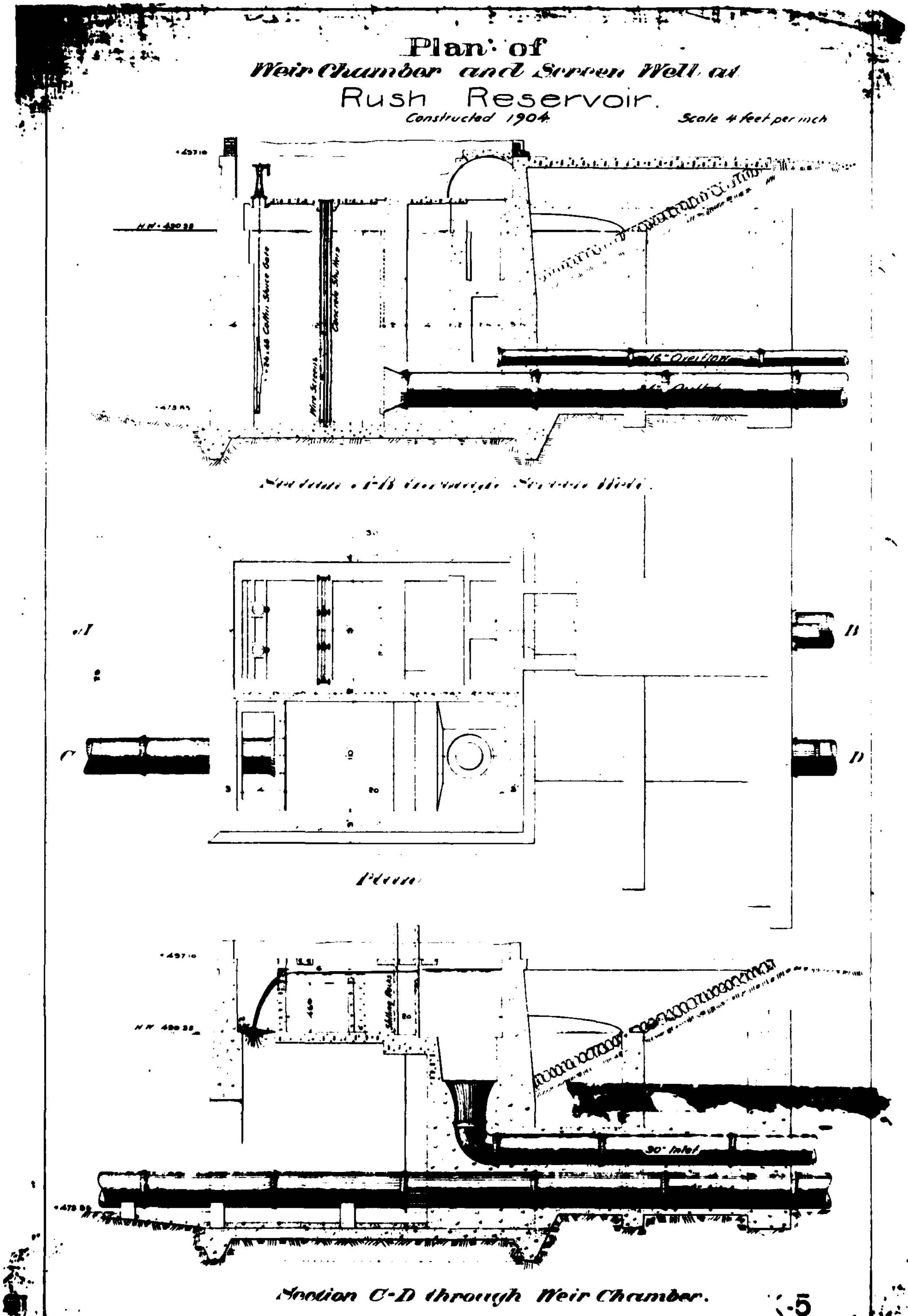

Plan of
Weir Chamber and Screen Well at
Rush Reservoir.
Constructed 1904
Scale 4 feet per inch
16" Overflow
A
B
C
D
30" Inlet
Section C-D through Weir Chamber.

FIGURE 5

DATE
FILME
2-8